

The Effect of E-Commerce Adoption on the Alignment among Traded Product, Buyer-Supplier Relationship, and Supply Chain Structure

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Abstract

The purpose of this study is to suggest conceptually the feature of alignment between SCM strategy and SC structure, and also disclose theoretically the effect of E-commerce adoption on such alignment. For this, this paper defines *number of suppliers, number of tiers, the level of SC integration, order penetration point, lead time, and safety stock* as supply chain structural issues, and sets *the characteristics of traded products and buyer-supplier relationship* as key strategic issues for efficient construction of supply chain structure. Also, E-commerce adoption is designed as a moderate variable for the alignment between SC structure and the two strategic issues. Such effort suggests a conceptual framework to develop an advisable set of E-commerce adoption strategies for the efficiency improvement of overall supply chain management. The empirical research model proposed from such conceptual

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framework can be used to establish E-supply chain progression paradigm and new dimensional manufacturing strategy framework in E-commerce era.

I. Introduction

During the last decade, buying company has emphasized gradually the importance of strategic cooperation and supply-network construction with suppliers, and systematic supply chain management as a critical success factor for sustainable competitive advantage. In particular, recently, due to the development of computer and telecommunication technology, firms attempt to improve the efficiency of transaction between buyer and supplier by information sharing and communication through electronic commerce, and electronic commerce (EC) is recognized as a way that buying companies can manage more efficiently their supply chain. In the light of such current change and trend, electronic commerce between buyer and supplier is highlighted as not only a fresh opportunity to obtain competitive strategy, but also a facing task both buyer and supplier should challenge and overcome together.

The utilization of information technologies and systems in supply chain management has mainly focused on supply chain integration. Through the utilization of such information systems, companies have been able to attempt the integration of various functions spread over different areas within a company and with external suppliers and customers as well as curtail unnecessary activities, thus enhancing their capability to cope with sophisticated needs of customers and meet the quality standards of products(Bardi *et al.* 1994, Carter and Narasimhan 1995). However, from the supply chain management point of view, applying the business-to-business electronic commerce to the relationship between firms may be expected to make major changes. That is, Web-based electronic commerce, which has totally different characteristics with the existing information technologies and systems, may reduce the excessive dependence on supply chain integration with few key suppliers by deriving

complete competition in electronic market among numerous suppliers. This also means that the optimal points of supply chain structural issues related to and focused on just the establishment of supply chain integration may be changed by the level of E-commerce utilization. Of course, such expectation can be different depending on the characteristics of traded products, the strength of buyer-supplier relationship, and company's practical capability. Accordingly, this trend motivates that future research should first focus on the influence of B-to-B EC on the alignment between supply chain integration and other SC strategic/structural issues under new business model prior to the discussion on the role and function of B-to-B EC for the efficient construction of supply chain integration.

Also, the research on E-commerce technology itself too much focusing on the indiscreet introduction of information system such as EDI and ERP should be changed. Numerous companies, under the obscure expectation that E-commerce can fulfill all of company's needs, have made unconditionally immense investments on the introduction of E-commerce technology without any consideration on product characteristics, environmental factors, business strategy, and current supply chain structure. However, in spite of such indiscreet introduction, many companies do not have big benefits as expected. Even though E-technology has considerable influences on entire operations and decision-making procedure of a company in small-to-medium companies as well as large companies, top managers are not being able to come out with appropriate policy directions or problem solutions due to the insufficiency of technical and administrative recognition on E-technology. This is because researches on E-commerce adoption in terms of the effective implementation of E-technology for sustainable competitiveness are insufficient relative to those on E-commerce technology itself. In other words, past researches on E-commerce technology has mainly focused on the availability and significance of E-technology itself. The assertion of Keen(1993) that the difference in competitive and economic benefits which firms can obtain from E-commerce technology is dependent on

not the difference in technology itself, but the difference in managerial capability, emphasizes the importance of research on E-commerce adoption in supply chain management.

Conclusively, the systematic design of supply chain structure, the appropriate application of information technologies, and the establishment of appropriate relationships among supply chain members, are the most important key strategic factors for acquiring sustainable competitive advantage. Viewed in this perspective, strategic alignment between key SCM strategic and structural issues, and between such strategic/structural issues and E-technology adoption, should be regarded as the most significant and urgent research theme for the construction of a competitive future SCM strategy.

The purpose of this study is to suggest conceptually the feature of alignment between SCM strategy and SC structure, and also disclose theoretically the effect of E-commerce adoption on such alignment. Such effort should provide theoretical foundation for the suggestion of a conceptual framework to develop the utilization strategy of e-commerce technology for strategic supply chain management. This framework can be used not only to establish E-supply chain network system with suppliers, customers, and internal functions within a firm in an operational perspective, but also to achieve company-level strategic alignment between SCM strategy and manufacturing strategy for the innovation of traditional product-process structure in a strategic perspective.

II. The Alignment between Supply Chain Structure and Strategy

Even though supply chain needs to be evaluated and managed as a unit, few researches have analyzed supply chain as a unit. Most researches have focused on one part or several parts out of overall supply chain functions, such as forecasting, planning, production control, inventory control, scheduling, etc., and just a small number of researches have investigated the relevance among such parts(Hoekstra and Romme 1991; Towill et al. 1992). That is, even

though the necessity of integrated supply chain management has consistently been emphasized, the research on the overall structure of supply chain, which is the starting point for supply chain management, is almost beginning stage(Hoekstra and Romme 1991; Towill et al. 1992). Generally, previous researches show general agreement in that the level of supply chain diversification, the level of supply chain integration, lead time of supply chain, the *response point* of supply chain, and the level of safety stock, can be the most representative key issues for the design of supply chain structure(Bucklin 1973; Hoekstra and Romme 1991; Christopher 1992; Lagodimos 1992; Lassar and Kerr 1996; Towill 1996; Disney et al. 1997; Jones et al. 1997). The discussion on the effect of these supply chain structural issues on performance is started from theoretical relevance with supply chain strategic issues.

The most important strategic issue, which should be considered in the design of such supply chain structure, is the characteristics and strategy of traded products(Fisher 1997). Fisher(1997) asserted that traded products can be classified into functional product and innovative product, and supply chain appropriate for each product category should be designed. Lassar and Kerr(1996) examined the relationship between a company's supply chain structure and primary product strategy such as differentiation, cost leader, and focused strategies. Fisher(1997) emphasized the length and thickness of supply chain in the design of supply chain, while Lassar and Kerr(1996) considered mainly the partnership between manufacturer and distributor and the regional intensity of distribution. Bensaou(1999) showed that the characteristics/strategy of traded product might be closely related to the strength of buyer-supplier relationship, through the suggestion of the portfolio of inter-firm transaction relationship by the level of investment on the transaction-specific asset of buyer or supplier. That is, they suggested that the type of market exchange relations in which the technical and economical dependence of both buyer and supplier on each other is relatively low, is appropriate for highly standardized products, while the type of strategic partnership in which

buyer-supplier relationship is strongly connected by considerable transaction-specific assets of both buyer and supplier, is significantly correlated with highly customized products. When considering the relationship between a company's supply chain structure and product strategy Fisher and Lassar/Kerr identified, such matching of product characteristics/strategy and buyer-supplier relationship implies that the strength of buyer-supplier relationship also can be the key strategic issue for constructing efficiently supply chain structure. In fact, Anderson, Hakansson, and Johanson(1994) commented that depending on the position and level of negotiation power between buyer and supplier, the overall design and type of supply chain structure could be different, thus supporting the above argument.

The level of supply chain diversification in horizontal perspective, which is one of structural issues, means the length of supply chain, that is, the number of participants included in a supply chain from procuring raw materials to delivering finished products(Hoekstra and Romme 1991; Jones et al. 1997). Forrester(1961) suggested five stages such as raw material supplier, manufacturer, factory warehouse, distributors, and retailers, as typical supply chain path, and on the basis of such five supply chain paths, numerous subsequent researches have been consistently implemented by mainly using normative modeling methods such as simulation and heuristics. Also, with horizontal supply chain diversification, the interest on the effect of supply chain diversification in the vertical perspective has increased. Vertical supply chain diversification means the width of supply chain identifying additional supply chains where a firm can establish a presence, and extending a firm's supply chain to include members beyond immediate suppliers and customers(Bakos 1991). This has the same logic with the diversification of transaction line and the expansion of distribution network(Anderson and Coughlan 1987; Cespedes 1988; Rosenbloom 1995; Lassar and Kerr 1996). The reason that the significance of supply chain diversification is increasingly brought out is because bullwhip effect or demand amplification among various reasons for imbalance between

demand and supply is particularly influenced by the number of participants in a supply chain and the diversification of transaction line(Wikner et al. 1991; Towill et al. 1992; Towill 1996; Disney et al. 1997; Jones et al. 1997). Previous researches on the relevance between the length of supply chain and strategic issues(Anderson and Gatignon 1986; Miller 1988; Eisenhardt 1989; Lassar and Kerr 1996) have agreed that in case of standardized/cost leader focused product appropriate for market exchange relations structure, the necessity of controlling the number of participants in a supply chain is relatively low due to the low weights of monitoring and cooperation on supply chain, while in case of customized/differentiation focused product, systematic monitoring and cooperation on supply chain is more emphasized in order to support various types of services to customers. Thus, in case of customized/differentiation focused product connected to strategic partnership structure, the possibility that a firm attempts to reduce intermediate supply chain participants and increase monitoring and trust among supply chain members is higher. Also, Bakos(1991) suggests a meaningful argument on the relevance between the width of supply chain and strategic issues. That is, in terms of buyers, in case of standardized/cost leader focused product appropriate for market exchange relations structure, the number of transaction-available supplier is expected to increase, because the change of supply line is relatively easy due to the low level of dependence on supplier, transaction-specific asset, and changeover cost. Meanwhile, in case of customized/differentiation focused product connected to strategic partnership structure, the benefits of increasing the number of supplier may be reduced, because the incentives for improving non-contractible factors except price such as quality, flexibility, responsiveness, speed, and innovativeness are more strongly required.

Supply chain integration can raise some questions on the independence of supply chain participants: should raw material suppliers or distributors be internalized in the design of supply chain structure? Should finished products be sold directly to customers, or are intermediate distributors necessary? How

should managerial independence be established in the relationships among supply chain members? Generally, it has been recognized that such independence of supply chain participants may be the direct reason of imbalance between demand and supply(Lee and Billiton 1992; Lee et al. 1996). Particularly, Lee et al.(1996), in the explanation on bullwhip effect, assert the necessity of avoiding excessive managerial independence and integrating various supply chain functions, because independent forecasting of each of supply chain participants and gaming among participants may lead to the imbalance of demand and supply, that is, the creation of excessive supply chain inventory. This has the same context with demand amplification in industrial dynamics that Forrester(1961) and Burbidge(1961) advocated. Wikner et al.(1991) also support the above argument. However, the necessity of supply chain integration described above can be different depending on the type of product strategy and buyer-supplier relationship, similarly with the case of supply chain diversification. That is, in case of standardized/cost leader focused product suitable for market exchange relations structure, managerial independence may be guaranteed, because it is expected that result-based contract among supply chain members is emphasized and the necessity of monitoring/promotion on supply chain members is low(Lassar and Kerr 1996). Meanwhile, in case of customized/differentiation-focused product aligned with strategic partnership structure, product life cycle is relatively short and various kinds of competitive factors(technology, design, service) except product price should be supported. Also, the demand of finished product is considerably unstable. Accordingly, buyer should support various types of promotion activities(Winter 1993; Lassar and Kerr 1996), and accomplish high level of cooperation or integration with other supply chain members by providing high margin(Porter 1980; Anderson and Gatignon 1986; Miller 1987, 1988; Anderson and Schmittlein 1994; Lassar and Kerr 1996). Also, systematic training for differentiated product/service and buying firm's monitoring on distributor are more strongly required, because there are a large amount of information which should be processed(Galbraith

1973) and a high possibility of decision-making's delay(Govindarajan 1985). Therefore, the possibility of *behavior-based contract* among supply chain members is very high(Lassar and Kerr 1996). In other words, the likelihood that buyer pursues high level of cooperation and integration with external supply chain members with enduring high burden of integration costs and political conflicts is very strong.

The lead time of supply chain means the time taken from the orders of final customers to the delivery of finished products or services(Christopher 1992; Krajewski and Ritzman 2000). Many previous researchers assert that the reduction of lead time has the role of time competitiveness as the creation of value added, and thus the reduction of lead time should be preceded for obtaining sustainable competitiveness(Stalk and Hout 1990; Christopher 1992; Krajewski and Ritzman 2000). However, the lead time of supply chain may also have influences on other kinds of supply chain related activities. That is, the reduction of supply chain lead time can lead to the reduction of safety stock, order frequency, and order batch size. But, transportation cost increases. In other words, if lead time is reduced and distribution time is frequent, overall inventory level is decreased, while transportation is increased. Like this, the reduction of supply chain lead time may induce trade-off relationships among various supply chain variables(Magee et al. 1985). The reduction of lead time in this respective does not have a significant effect on the reduction of total cost. Therefore, the approaches for minimizing total costs should be considered in managing supply chain lead time(Bowersox and Closs 1996). In case of customized/differentiation focused product and strategic partnership structure, the type of supplying immediately products when necessary may be preferred to that of placing a large amount of inventories on distributors or retailers, because margin rate and value added are high. Thus, in order to pursue high customer service with low inventory level, quick response logistics system should be constructed. Also, in case of customized/differentiation-focused product, a wide range of product lines should be completed and the

necessity of consistent product innovation and R&D is high. Because of such characteristics of product variety, it is very difficult for distributors or retailers to hold and control properly the inventories of various kinds of products in their warehouses or sales shops(Fisher 1997). Accordingly, in this case, it is advisable to reduce supply chain lead time in order to deal effectively with immediate demand. However, in case of standardized/cost leader focused product suitable for market exchange relations structure, it is expected that most orders are made by the type of batch, because the level of demand uncertainty is relatively low, and the responsibility of demand uncertainty may be shifted onto other supply chain members through result-based contract among supply chain members as mentioned previously. Accordingly, in case of such order with batch type, supply chain lead time may be relatively long.

The response point of supply chain, which is defined as order penetration point by Christopher(1992), is the point of starting physical response to orders from customers, in which push by demand forecast and pull by customer order come across(Hoekstra and Romme 1991; Jones et al. 1997). The discussion on the response point of supply chain has consistently continued, and recognized as a key manufacturing strategy with defining as positioning strategy(Krajewski and Ritzman 2000). Krajewski and Ritzman(2000) classified positioning strategy into make-to-stock strategy, assemble-to-order strategy, and make-to-order strategy. Meanwhile, Hoekstra and Romme(1991) classified more specifically decoupling points into make and ship-to-stock, make-to-stock, assemble-to-order, make-to-order, and purchase and make-to-order. Such response point should be designed by a manufacturer, and the manufacturer should establish an optimal response point by considering the characteristics of traded products, product strategy, and related environmental factors(Hoekstra and Romme 1991; Macbeth and Ferguson 1994; Jones et al. 1997). In case of standardized/cost leader focused product, the level of product variety is not high(Hambrick 1983), demand is stable(Miller 1988), and demand area is generally wide(Porter 1980; Miller 1987). Also, the strength of buyer-supplier

relationship may be relatively weak because market governance structure is expected to appear dominantly as mentioned previously. Thus, the likelihood that response point is built in the upstream of supply chain is high. Meanwhile, in case of customized/differentiation focused product, the level of product variety is high (Porter 1980; Miller 1987), demand is unstable (Miller 1988). Also, the level of support and cooperation among supply chain members for dealing with effectively demand uncertainty is relatively high (Anderson and Gatignon 1986; Miller and Friesen 1986; Ward et al. 1996; Lassar and Kerr 1996), because it is expected that hierarchical governance structure by strategic partnership between buyer and supplier and behavior-based contract among supply chain members are mainly shaped (Eisenhardt 1989; Lassar and Kerr 1996). According to these characteristics, firms with customized/differentiation-focused product would try to obtain information on final demand more quickly than firms with standardized/cost leader focused product. Thus, the likelihood that response point is established in the downstream of supply chain is strong. The decision for such order penetration point can be related to the pursuit of geographic proximity to supplier and customer.

In case of standardized/cost leader focused product, the characteristics of demand stability and the availability of multi-suppliers by taking market governance structure can induce the reduction of safety stock. Meanwhile, in case of customized/differentiation focused product, safety stock may be maintained consistently at high level, because high customer service is pursued, demand uncertainty is inherent, and the unexpected accident of key supplier can lead to the difficulty of immediate response to customer orders when pursuing excessively strategic partnership with key supplier.

Table 1: The Alignment among SC Structure and SCM Strategy

<i>Structural Issues</i>	<i>Standardized product-Market exchange relations</i>	<i>Customized product-Strategic partnership</i>	<i>Key Literatures</i>
No. of Suppliers	High -because the change of supply line is relatively easy due to the low level of dependence on supplier, transaction-specific asset, and changeover cost.	Low -because the incentives for improving non-contractible factors such as quality, speed, and innovativeness except price is more strongly required	Bakos (1991)
No. of SC Tiers	High -because the necessity of controlling the number of participants is relatively low due to the low weights of monitoring and cooperation on supply chain	Low -because systematic monitoring and cooperation on supply chain is more emphasized in order to support various types of services to customers.	Lassar/Kerr(1996)
The Level of SC Integration	Low -because result-based contract among supply chain members is emphasized and the necessity of monitoring/promotion on SC members is low	High -because behavior-based contract among supply chain members is emphasized and the necessity of monitoring/promotion on SC members is high	Lassar/Kerr(1996) Anderson/Schmittlein (1994)
Lead Time	Relatively Long -because the level of demand uncertainty is relatively low, and thus most orders are made by batch type	Relatively Short -because quick response logistics system is required in order to deal with effectively immediate demand.	Fisher (1997)
Response Point (Order Penetration Point)	Upstream -because the level of product variety is not high, demand is stable, and demand area is generally wide	Downstream -because the level of product variety is high, demand is unstable, the level of support and cooperation among supply chain members is high	Lassar/Kerr(1996) Eisenhardt (1989)
Safety Stock	Low -because of high demand stability and the availability of multi-suppliers by taking market governance structure	High -because of the pursuit of high customer service, high demand uncertainty, and the unexpected accident of key supplier	Hoecstra/Romme (1991) Jones et al. (1997)

III. The Effect of E-Commerce on the Alignment between SC Structure and Strategy

As discussed above, the key issues for the design of supply chain structure may be influenced by the characteristics/strategy of traded products and buyer-supplier relationship. In other words, depending on which type of product strategy and buyer-supplier relationship are combined with supply chain structural issues, the direction itself for designing supply chain structure can be totally different, and further the effect of supply chain structure on performance can be also diverse. The introduction of B to B E-commerce can contribute to the efficiency improvement of supply chain structure, because it can provide product information, inventory level, shipping information, and the information on customer requirement on a real-time basis (Radstaak and Ketelaar 1998). Particularly, because buying company can establish cooperative planning on demand forecasting and production schedule with supplying company through information sharing by E-commerce, the potential of E-commerce for the efficient design of supply chain structure is tremendous (Karoway 1997). Additionally, E-commerce makes 'pull' supply chain management possible by linking effectively each function in a supply chain with customer's demand information (Kalakota and Whinston 1997).

However, the introduction of E-commerce may somewhat change the type of relevance between the width of supply chain and strategic issues which Bakos (1991) argues. Transaction cost theory suggests that information technology and inter-organizational information systems can reduce transaction-specific asset and the cost of achieving information about prices and product characteristics, and such reduction should lead to an increase in the number of suppliers, particularly in markets with differentiated products. Similarly, Malone et al. (1987) argue that the ratio of electronic market structure to inter-firm relationship will be increased according to the development of telecommunication technology. Viewed in these perspectives, it is predicted that

Web-based E-commerce adoption may increase the number of supplier within a limited scope, even in strategically important customized products. Therefore, we can expect that even though the effort for maintaining cooperative relationship on strategically important customized products by reducing the number of supplier will be continued, the intensity will be weakened according to the introduction of Web-based E-commerce.

Such kind of change also may be indicated in the relationship between the length of supply chain and strategic issues. That is, in case of customized/differentiation focused product emphasizing more systematic monitoring and cooperation on supply chain by strategic hierarchical partnership structure in order to support various types of services to customers, the likelihood that a firm attempts to reduce intermediate supply chain participants is higher. However, E-commerce adoption may decrease the necessity of reducing intermediate participants compulsorily with enduring the burden of related costs by reducing the level of dependence on physically-contacted monitoring and increasing the capability of real-time information sharing. Consequently, the introduction of Internet or Web-based E-commerce enables buyers to pursue the moderate electronic market structure even on strategically important customized products and maintain the proper number of intermediate supply chain participants.

Such introduction of E-commerce also may have an influence on the relevance between the level of supply chain integration and strategic issues. That is, E-commerce adoption may make it possible for buying firms to obtain the effects of integration simultaneously with guaranteeing somewhat the managerial independence of other chain members by supporting the capability of continuous and consistent remote monitoring/promotion on supply chain members. Therefore, it can be foreseen that buying firms with high level of E-commerce adoption do not need to pursue excessive supply chain integration even on customized/differentiation-focused product.

Also, the development of E-commerce technology requires the change of the

traditional concept on trade-off relationships among lead time, distribution frequency, inventory level, and transportation cost. That is, the development of E-commerce technology can lead to the consecutive reductions of total transportation cost and total inventory cost by grafting advanced information technology onto logistics and inventory processing activities. When representing the trade-off relationship between transportation cost and inventory cost in two-dimensional diagram assuming that the x-axis indicates lead time and the y-axis indicates cost, such consecutive reductions should shift the minimum point of total cost (the point that both non-linear lines for transportation cost and inventory cost are crossed) into right and down side. This means that the point of lead time fitting to the minimum point of total cost shifts to right side relative to the existing lead time. Therefore, the development of E-commerce may enable buying firms to accept a little longer lead time relative to the existing lead time which has been believed to guarantee minimum total cost. According to this logic, it can be anticipated that if the level of E-commerce adoption is relatively high, the significance of reducing the lead time of supply chain will be less even in customized/differentiation-focused product and strategic partnership structure.

The utilization of E-commerce may change traditional perspectives on the response point of supply chain. That is, Internet or Web-based E-commerce adoption can improve the capability of remote monitoring and precise prediction on demand information, product variety, and market situation. Accordingly, it is expected that even firms with customized/differentiation-focused product may pursue the shift of response point into more upstream level of supply chain through the utilization of E-commerce. This makes it possible for manufacturing firms to accomplish the proper balance between the flexibility of switching promptly to new products to deal effectively with demand uncertainty by shifting order penetration point into upstream and the quick response capability on customer demands, which Berry et al.(1994) emphasizes.

Table 2: The Effect of E-Commerce Adoption on Supply Chain

<i>Structural Issues</i>	<i>The Effect of E-Commerce</i>	<i>Related Literatures</i>
No. of Suppliers	Because inter-organizational information systems can reduce transaction-specific asset and the cost of achieving information about prices and product characteristics, and the ratio of electronic market structure to inter-firm relationship will be increased according to the development of telecommunication technology, it is predicted that Web-based E-commerce adoption may increase the number of supplier within a limited scope, even in strategically important customized products.	Malone et al.(1987)
No. of SC Tiers	EC adoption may decrease the necessity of reducing intermediate participants compulsorily with enduring the burden of related costs by reducing the level of dependence on physically contacted-monitoring and increasing the capability of real-time information sharing, even in strategically important customized products.	Malone et al.(1987)
The Level of SCI	It can be foreseen that buying firms with high level of E-commerce adoption do not need to pursue excessive supply chain integration even on customized/differentiation focused product by acquiring the capability of continuous and consistent remote monitoring/promotion on supply chain members.	Lassar/Kerr(1996)
Lead Time	The development of EC technology can lead to the consecutive reductions of total transportation cost and total inventory cost by grafting advanced IT onto logistics and inventory processing activities. Such consecutive reductions should shift the minimum point of total cost into left and down side. Therefore, the development of EC may enable buying firms to accept a little longer lead time, even in customized products.	Fisher (1997)
Response Point (Order Penetration Point)	Even firms with customized/differentiation focused product may pursue the shift of response point into more upstream level of supply chain by improving the capability of remote monitoring and precise prediction on demand information, product variety, and market situation through the utilization of E-commerce.	Krajewski/Ritzman (2000) Berry et al.(1994)
Safety Stock	If the construction of automatic quick-response logistics system with the shift of response point into more upstream level can be accomplished successfully through the utilization of Internet or Web-based E-commerce as mentioned previously, even firms with customized/differentiation focused product may expect the benefits from the reduction of safety stock.	Hoecstra/Romme(1991) Jones et al.(1997) Bowersox/Closs(1996)

Such argument on the relationship between E-commerce adoption and the response point of supply chain can also explain the effect of E-commerce on the relationship between safety stock and the characteristics of traded product or buyer-supplier relationship. If order penetration point is shifted to upstream, average safety stock in a supply chain may increase in order to fulfill customer demands on time and reduce lead time for order fulfillment. This is because the weight of push-type management will be decreased, while the weight of pull-type management is anticipated to increase (Hoecstra and Romme 1991; Jones et al. 1997). However, if the construction of automatic quick-response logistics system simultaneously with the shift of response point into more upstream level can be accomplished successfully through the utilization of Internet or Web-based E-commerce as mentioned previously, even firms with customized/differentiation focused product may expect the benefits from the reduction of safety stock because more precise forecast on demand fluctuation by real-time information sharing is possible. This means that traditional perspectives on the relationship between safety stock and strategic issues can also be changed depending on the level of E-commerce adoption. Of course, in order to validate the above argument, the analysis of the trade-off relationships between additional costs and improved benefits induced by the change of response point and the reduction of safety stock should be preceded (Bowersox and Closs 1996). Generally, it is predicted that under total cost minimization approaches, improved benefits are superior to additional costs.

IV. Conclusion and Expected Contributions

As mentioned previously, the purpose of this study is to suggest conceptually the feature of alignment between SCM strategy and SC structure, and also disclose theoretically the effect of E-commerce adoption on such alignment. For this, this paper defined *number of suppliers*, *number of tiers*, *the level of SC integration*, *order penetration point*, *lead time*, and *safety stock* as supply

chain structural issues, and set *the characteristics of traded products* and *buyer-supplier relationship* as key strategic issues for efficient construction of supply chain structure. Also, E-commerce adoption was designed as a moderate variable for the alignment between SC structure and the two strategic issues. Such effort suggests a conceptual framework for the establishment of empirical research model to develop the utilization strategy of e-commerce technology for strategic supply chain management.

From the future empirical test for the validation of the proposed conceptual framework, this paper expects the following major suggestive contributions.

First, we can suggest specifically an advisable set of E-commerce adoption strategies for supply chain management in SC structural perspectives as well as in strategic perspectives. The identification of both the independent main effect and the interaction effect of E-commerce adoption on the design of supply chain structure and the establishment of supply chain strategy will enable us to accomplish the main purpose of this paper.

Second, we can construct E-supply chain progression paradigm. Traditionally, it has been generally accepted that the E-network would shift from private network through value-added network to open network. Kim(1999) and Klein(1995) suggest three types of linkage between E-network types and buyer-supplier relationships in the perspective of linkage between technological and organizational developments: *Hierarchical strategic partnership structure-Private network*, *Intermediary network structure-Value-added network*, *Market exchange relations structure-Open network*. When considering that buyer-supplier relationship can be directly related to the characteristics of traded products and issues for the design of supply chain structure, Kim(1999) argues that inter-organizational E-network can have a direct influence on the efficient combination of supply chain strategy and structure. By testing empirically the above described matching between SC strategic/structural types and the developmental stage of E-network, we can identify the possibility of constructing an E-supply chain progression paradigm.

Third, we can identify the possible existence of new types of supply chain structure. Fisher(1997) argues that typically, according to the characteristics of traded products, a supply chain can be classified into either a physically efficient supply chain or a market-responsive supply chain. By considering buyer-supplier relationship and the effect of E-commerce adoption other than the characteristics of traded product, we can investigate the validity of Fisher's argument and further gropes for the likelihood of creating new type of supply chain structure suitable for supply chain management in E-commerce era.

Fourth, we can identify the most compatible sets of the characteristics of traded products and buyer-supplier relationship for the above mentioned E-supply chain progression. Bensaou(1999) showed that market exchange relation is appropriate for highly-standardized products, while strategic partnership is significantly correlated with highly-customized products. Previous literatures have analyzed the relevance between strategic issues and structural issues in supply chain management under the general agreement on the above combination type Bensaou(1999) suggests. Through the analysis on the relationship between E-commerce adoption and interaction effect of the characteristics of traded products and buyer-supplier relationship, we can investigate the possibility that the matching type of product strategy and buyer-supplier relationship suitable for E-commerce era can be different.

Fifth, we can suggest a new dimensional manufacturing strategy framework in E-commerce era. Grover and Malhotra(1999) comment that the trade-offs between achieving mass production and mass customization(Pine et al. 1993) need not be made as rigorously as in the past. Further, they suggest that the utopian goal of efficient mass customization with line flow strategies can be accomplished, and advanced information and process technology can lead such transition from the traditional product-process matrix. We can test empirically the possibility that the utilization of E-commerce technology to link supply chain structure to strategic issues realize such utopian goal.

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